

P425/1&2
PRINCIPAL MATHEMATICS
PAPER 1 &2
NOVEMBER, 2025
3 HOURS



ANKOLE DIOCESE EXAMINATIONS SECRETARIAT

S5 END OF CYCLE ASSESSMENT – 2025
MATHEMATICS

PAPER 1 &2

TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

- *Both items in section A are compulsory.*
- *Section B has part one, part two, part three and part four. For each part attempt at least one but not more than two items.*
- *Any additional item(s) attempted will not be marked.*
- *All necessary working must be shown clearly.*
- *Squared paper is provided.*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

Turn Over

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SECTION A:
Answer all items.

ITEM ONE

An aviation company frequently experiences take off accidents. The company hired a team of aeronautic engineers to investigate the problem. The engineers discovered that the accidents are mainly due to inaccurate take off angles from computer simulations of the company planes, they concluded that proper take off angles should satisfy $4\cos\theta = 2\tan\theta + 3\sec\theta$. They also advised that due to the erratic winds, pilots should use the takeoff trajectory

$$y = \frac{\sin \tan x}{1 - \cos x} - 1$$

The remaining task is for the pilots to figure out the actual values of proper take off angles and the equation of the recommended take off trajectory in its simplest possible form.

TASK

Help the pilots to;

- (a) Determine the values of the proper takeoff angles.
- (b) Realize that the recommended takeoff trajectory is simply $y = \sec x$

(12 scores)

ITEM TWO

A rectangular piece of land had dimensions with length $l = 6.2\text{m}$ and width $w = 5.36\text{m}$ and the owner wanted to make a flower garden on it.

TASK

The owner requested you to determine the absolute error relative error and percentage error in the

- (a) Perimeter of the flower garden
- (b) Area of the flower garden.

(12 scores)

SECTION B
PART 1

Attempt only one item from this part

ITEM THREE

A hall with a rectangular floor measuring 80m by 40m is to be centrally covered with decorating floor tiles covering a rectangular area 2100m². The technicians have requested that a sketch of the floor including the area to be covered with all the measurements be provided so that they donot make any mistake.

TASK

- (a) Determine the uniform distance of the decorated area from the inner walls of the hall.
- (b) Hence, produce the sketch requested by the technicians.

(12 scores)

ITEM FOUR

A man wanted to buy one trip each of lake sand and plaster sand and two trips of gravel for construction of his kitchen.

He consulted some people and the following was the information he obtained;

The first person spent shs 380,000 for three trips of lake sand, two trips of plaster sand and one trip of gravel

The second person spent shs 900,000 for one trip of lake sand, three trips of plaster sand and four trips of gravel.

The third person spent shs 700,000 for two trips of lake sand, one trip of plaster sand and three trips of gravel

TASK

The man kindly requests you to make a budget for the materials he wants to buy.

(12 scores)

PART 2

Attempt only one item from this part

ITEM FIVE

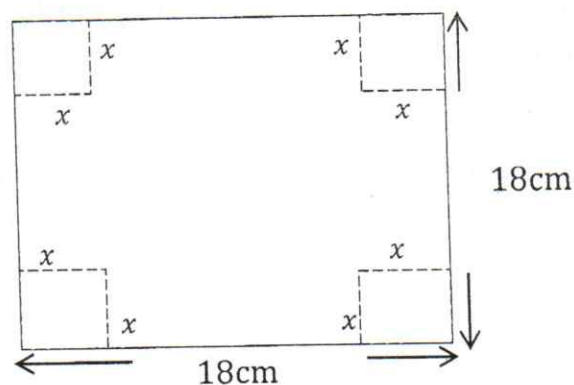
A slow train which stops at every station passes a certain signal box at noon. Its motion between two adjacent station is such that it is 5km past the signal box t minutes past noon where $S = \left(\frac{t}{3} + \frac{t^2}{9} - \frac{t^3}{27}\right)$ km.

Determine

- the time of departure from the first station and the time of arrival at the second station.
- the distance of each station from the signal box.
- Average velocity between the two stations.
- Velocity within which the train passes the signal box. (14 scores)

ITEM SIX

- The height of the fence (in metres) at any point x metres from start is given by $y = x^2 - 5x + 4$
 - A separate section of the fence has its width given by $\frac{x^2+x-1}{1-x^2}$. Determine the rate of change of this with respect to x .
 - Draw a sketch of the height of the fence and obtain the area of the entire fence.
- Square pieces are cut out of a square piece of metal in certain metal workshop as shown in the figure and the remainder folded about the dotted line so as to form an open box.



If the length from the edge of square sheet is 18cm.

TASK

Help the welder in this workshop to determine the maximum volume of the box. (14 scores)

PART THREE
Attempt only two items from part 3

ITEM SEVEN

Traffic officers measured the speeds of 60 vehicles on the road where the speed limit is at least 47kmhr^{-1} but not exceeding 70kmhr^{-1} . The speed limit data was grouped as shown below.

Speed	Number of vehicles
20 - < 30	10
30 - < 35	6
35 - < 45	4
45 - < 55	13
55 - < 60	8
60 - < 75	12
75 - < 80	7

TASK

Help the offers to;

- (a) Calculate
 - (i) Average speed
 - (ii) Most frequent speed on the road

- (b) Draw a suitable graph and use it to determine
 - (i) The percentage of driver who comply with the speed limit
 - (ii) The number of drivers who are too fast.

(13 scores)

ITEM EIGHT

A certain company deals in computers and their major parts namely; the CPU (C), the monitor (M) and the keyboard (K)

Experience has it that, on delivery, the probability that C works correctly is 0.98, the probability that M works correctly is 0.95 and the probability that K works correctly is 0.97.

Given that

P_3 is the probability that all the three parts work correctly.

P_2 is the probability that only two of them work correctly.

P_0 is the probability that none of them works correctly.

The procurement manager of the company will make a new order if $P_3 \leq 0.9$ or $P_2 \leq 0.09$ or $P_0 \geq 0.1$.

To maintain the quality of the employees, the employees regularly answer questions which are randomly and automatically generated by the computer. The probability that the first question is answered correctly is 0.75. If a question is answered correctly, the probability of answering the next question correctly reduces by 0.05 but if a question is answered wrongly, the probabilities of answering the next question remain unchanged.

TASK

By determining

- (a) the probabilities P_3, P_2, P_0 state whether or not the manager should make a new order of the computer parts.
- (b) the probability that the second question is answered correctly and the probability that third question is answered correctly, explain to the manager which of the questions 1st, 2nd or 3rd that is most likely given a correct response to.

(13 scores)

ITEM NINE

Box P contains 4 red and 3 green sweets, box Q contains 7 red and 4 green sweet. A box is randomly selected and two sweets are randomly picked one at a time without replacement. If P is twice as likely to be picked as Q.

TASK

Determine the;

- (a) probability that both sweets are of
 - (i) same colour
 - (ii) from P given they are of the same colour
- (b) (i) Probability distribution function of green sweets
(ii) hence find mean and standard deviation of the distribution.

(13 scores)

PART 4

Attempt only two items from this part.

ITEM 10

An engineer is designing a steel rectangular gate frame ABCD for a draw bridge system. The frame has dimensions $AB = 4\text{m}$ and $BC = 3\text{m}$. Various mechanical forces due to different sources of magnitudes 9N , 3N , 8N , 12N and 30N act along AB, BC, CD, DA and AC respectively in the directions given by the order of the letters. Taking AB and AD as the reference positive x and y axes respectively.

TASK

By writing each of the forces into vector form, help the engineer to determine the magnitude of one single effective force acting on the frame and the direction in which the frame will move if nothing is done to stop it. *(12 scores)*

ITEM ELEVEN

A traffic police officer is monitoring a highway when an overloaded taxi travelling at 90kmhr^{-1} passes him at point A. Two seconds later the officer starts his car from rest and begins the chase accelerating uniformly at 6ms^{-2} until the police car catches up with the taxi at B. After meeting at B, the officer suddenly applies the brakes and decelerates uniformly at 12ms^{-2} until it comes to rest at C, while the taxi keeps going at the same speed for 3 more seconds and then applies the brakes and decelerates uniformly for a further 6 seconds before coming to rest at C.

For record purposes, just in case there is need to invoke the law, the officer needs to take record of all the necessary information.

TASK

Help the officer to provide the following

- How long does it take the police car to travel from A to B?
- Determine the distance AB.
- At what speed was police travelling when it just reached at B?
- How long does the police car take to travel from B to C?
- At what rate did the taxi decelerate before coming to rest at C?

(12 scores)

ITEM TWELVE

A block of weight 20N rests on a rough plane of inclination 30° to the horizontal. If the coefficient of friction is 0.25.

Find the;

- (a) Horizontal force required to prevent the block from slipping down the plane.
- (b) Force at an angle of 20° to the line of greatest slope required to make it just about to slide up the plane.

==END==